Abstract

A method is provided for uniformly implanting a wafer with an ion beam. The wafer is generally of the type with a surface area in the form of a disk with a diameter and center. The ion beam is first formed as an elongated shape incident on the wafer, the shape having a length along a first axis smaller than the diameter, and a width shorter than the length along a second axis. Next, the wafer is translated at a variable translational velocity in a direction substantially parallel with the second axis. The wafer is also rotated substantially about the center at a rotational velocity. These movements are made such that the ion beam implants the wafer with substantially uniform dose across the surface area of the wafer. The wafer is preferably translated such that the ion beam implants the wafer from one side of the wafer, across the surface area of the wafer, and through another side of the wafer, in a selected velocity versus position profile. The wafer is also tilted while rotating such that the ion beam implants the surface area at a substantially constant angle relative to a crystal axis of the wafer. The wafer can also be translated in a direction substantially parallel to the ion beam such that the ion beam implants the surface area with a substantially constant spot size. The methods of the invention also include determining beam current density of the ion beam, and adjusting the variable translational velocity, and rotational velocity, as a function of the current density.